

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A process for the hydrogenation and/or asymmetric hydrogenation of an imine of Formula (I) to an amine of Formula (II) and/or its other enantiomer:



I



II

wherein

R¹ is selected from the group consisting of aryl and heteroaryl, which two groups are optionally substituted;

R² is selected from the group consisting of hydrogen, aryl, heteroaryl, C₁₋₁₀alkyl, C₂₋₁₀alkenyl, C₂₋₁₀alkynyl, C₃₋₁₀cycloalkyl, C₃₋₁₀cycloalkenyl and C₃₋₁₀heterocyclo, which latter eight groups are optionally substituted; and

R³ is selected from the group consisting of optionally substituted C₁ to C₂ alkyl, optionally substituted C₃₋₁₀cycloalkyl and -CH₂-C=C-R⁶, in which R⁶ is selected from the group consisting of H, aryl, C₁₋₁₀alkyl, C₂₋₁₀alkenyl, C₂₋₁₀alkynyl, C₃₋₁₀cycloalkyl and C₃₋₁₀cycloalkenyl, which latter six groups are optionally substituted;

~~or R² and R³ are linked to form an optionally substituted ring;~~

wherein the optional substituents of R¹ and R² are independently selected from one or more of the group consisting of halo, NO₂, OR⁴, NR⁴₂ and R⁴, in which R⁴ is independently selected from one or more of the group consisting of hydrogen, aryl, C₁₋₆alkyl, C₂₋₆alkenyl, C₃₋₆cycloalkyl and C₃₋₆cycloalkenyl;

the optional substituents of R^3 and R^6 are independently selected from one or more of the group consisting of halo, NO_2 , OR^5 , NR^5_2 and R^5 , in which R^5 is independently selected from the group consisting of C_{1-6} alkyl, C_{2-6} alkenyl and C_{2-6} alkynyl; and one or more of the carbon atoms in the alkyl, alkenyl and/or alkynyl groups of R^1 , R^2 and/or R^3 is optionally replaced with a heteroatom selected from the group consisting of O, S, N, O and Si, which, where possible, is optionally substituted with one or more C_{1-6} alkyl groups;

said process comprising the steps of reacting imines of Formula (I) in the presence of H_2 , a base and a catalytic system in which the catalytic system comprises a base and a ruthenium complex comprising (1) a diamine and (2) a diphosphine ligand or monodentate phosphine ligand.

2. (Previously Cancelled)

3. (Original) The process according to claim 1, wherein the amine of Formula (II) or its opposite enantiomer, is produced in enantiomerically enriched form.

4. (Previously Cancelled)

5. (Previously Amended) The process according to claim 1, wherein R^1 is optionally substituted aryl.

6. (Original) The process according to claim 5, wherein R^1 is optionally substituted phenyl,

7. (Original) The process according to claim 6, wherein R^1 is unsubstituted phenyl.

8. (Previously Amended) The process according to claim 5, wherein R^2 is selected from the group consisting of hydrogen, aryl, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-6} cycloalkyl and C_{3-6} cycloalkenyl, which latter six groups are optionally substituted.

9. (Original) The process according to claim 8, wherein R^2 is selected from the group consisting of hydrogen, aryl and C_{1-6} alkyl, which latter two groups are optionally substituted.

10. (Original) The process according to claim 9, wherein R^2 is selected from the group consisting of hydrogen, phenyl, and C_{1-6} alkyl, which latter two groups are optionally substituted.

11. (Original) The process according to claim 10, wherein R^2 is selected from the group consisting of hydrogen, unsubstituted phenyl and methyl.

12. (Previously Amended) The process according to claim 5, wherein R^3 is selected from the group consisting of optionally substituted C_1 to C_2 alkyl and optionally substituted C_{3-6} cycloalkyl.

13. (Original) The process according to claim 12, wherein R^3 is methyl, ethyl, i-propyl, cyclopropyl, cyclobutyl, cyclopentyl or cyclohexyl, which latter four groups are unsubstituted.

14. (Previously Amended) The process according to claim 1, wherein R^2 and R^3 , including the atoms to which they are attached, are linked to form an optionally substituted 5- or 6-membered ring.

15. (Cancelled Herein)

16. (Previously Amended) The process according to claim 5, wherein the optional substituents for R^1 and R^2 in the compounds of Formula I, are independently selected from one or more of the group consisting of halo, NO_2 , OR^4 , NR^4_2 and R^4 , in which R^4 is independently selected from one or more of the group consisting of hydrogen, aryl and C_{1-4} alkyl, and the optional substituents of R^3 are independently selected from one or

more of the group consisting of halo, NO₂, OR⁵, NR⁵₂ and R⁵, in which R⁵ is independently selected from the group consisting of C₁₋₄alkyl.

17. (Original) The process according to claim 16, wherein the optional substituents for R¹ and R² in the compounds of Formula I, are independently selected from one or more of the group consisting of halo, NO₂, OH, OCH₃, NH₂, N(CH₃)₂, CH₃ and phenyl and the optional substituents of R³ are independently selected from one or more of the group consisting of halo, NO₂, OH, OCH₃, NH₂, N(CH₃)₂ and CH₃.

18. (Previously Amended) The process according to claim 5, wherein one to three of the carbon atoms in the alkyl, alkenyl and/or alkynyl groups of R¹, R² and/or R³ is optionally replaced with a heteroatom selected from the group consisting of O, S, N, NH and N-CH₃.

19. (Original) The process according to claim 18, wherein suitably one of the carbon atoms in the alkyl, alkenyl and/or alkynyl groups of R¹, R² and/or R³ is optionally replaced with a heteroatom selected from the group consisting of O, S, N, NH and N-CH₃.

20-24. (Previously Cancelled)

25. (Previously Amended) The process according to claim 1, wherein R⁶ is selected from the group consisting of H, aryl, C₁₋₆alkyl, C₂₋₆alkenyl, C₂₋₆alkynyl, C₃₋₆cycloalkyl and C₃₋₆cycloalkenyl, which latter six groups are optionally substituted.

26. (Original) The process according to claim 25, wherein R⁶ is selected from the group consisting of H and C₁₋₄alkyl.

27. (Original) The process according to claim 26, wherein R⁶ is H.

28. (Previously Amended) The process according to claim 25, wherein the optional substituents for R⁶ are independently selected from one or more of the group consisting

of halo, NO₂, OR⁵, NR⁵₂ and R⁵, in which R⁵ is independently selected from one or more of the group consisting of C₁₋₄alkyl.

29. (Previously Amended) The process according to claim 28, wherein the optional substituents for R⁶ are independently selected from one or more of the group consisting of halo, NO₂, OH, OCH₃, NH₂, N(CH₃)₂ and CH₃,

30. (Previously Amended) The process according to claim 25, wherein one to three of the carbon atoms in the alkyl, alkenyl and/or alkynyl groups of R⁶ is optionally replaced with a heteroatom selected from the group consisting of O, S, N, NH and N-CH₃.

31. (Previously Amended) The process according to claim 30, wherein one of the carbon atoms in the alkyl, alkenyl and/or alkynyl groups of R⁶ is optionally replaced with a heteroatom selected from the group consisting of O, S, N, NH and N-CH₃.

32. (Previously Amended) The process according to claim 1, wherein said ruthenium complex has the general Formula RuXY(PR₃)₂(NH₂-Z-NH₂) (III) or RuXY(R₂P-Q-PR₂)(NH₂-Z-NH₂) (IV), where Z and Q represent a chiral or achiral linker; the ancilliary ligands PR₃ and R₂P-Q-PR₂ represent monodentate and bidentate phosphines, respectively; and the ligands X and Y represent an anionic ligand.

33. (Original) The process according to claim 32, wherein the ligand PR₃:



represents a chiral or achiral monodentate phosphine ligand in which R is simultaneously or independently selected from the group consisting of optionally substituted linear and branched alkyl containing 1 to 8 carbon atoms, optionally substituted linear and branched alkenyl containing 2 to 8 carbon atoms, optionally substituted cycloalkyl,

optionally substituted aryl, OR and NR₂; or two R groups bonded to the same P atom are bonded together to form a ring having 5 to 8 atoms and including the phosphorous atom to which said R groups are bonded.

34. (Original) The process according to claim 32, wherein the ligand R₂P-Q-PR₂:

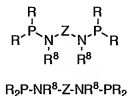


represents a bidentate ligand in which R is simultaneously or independently selected from the group consisting of optionally substituted linear and branched alkyl containing 1 to 8 carbon atoms, optionally substituted linear and branched alkenyl containing 2 to 8 carbon atoms, optionally substituted cycloalkyl, optionally substituted aryl, OR and NR₂; or two R groups bonded to the same P atom are bonded together to form a ring having 5 to 8 atoms and including the phosphorous atom to which said R groups are bonded; and Q is selected from the group consisting of linear and cyclic C₂-C₇ alkylene, optionally substituted metallocenediyl and optionally substituted C₆-C₂₂ arylene.

35. (Original) The process according to claim 34, wherein the ligand R₂P-Q-PR₂ is chiral and includes atropisomeric bis-tertiary phosphines, in which the two phosphorus atoms are linked by a biaryl backbone.

36. (Original) The process according to claim 35, wherein the ligand R₂P-Q-PR₂ is selected from the group consisting of BINAP, BIPHEP and BIPHEMP.

37. (Original) The process according to claim 32, wherein the bidentate phosphine is a chiral or achiral ligand of the type R₂P-NR^B-Z-NR^B-PR₂:



wherein each R, taken separately, is independently selected from the group consisting of optionally substituted linear and branched alkyl containing 1 to 8 carbon atoms, optionally substituted linear and branched alkenyl containing 2 to 8 carbon atoms, optionally substituted cycloalkyl, optionally substituted aryl, OR and NR₂; or two R groups bonded to the same P atom are bonded together to form a ring having 5 to 8 atoms and including the phosphorous atom to which said R groups are bonded; each R⁸, taken separately, is independently selected from the group consisting of hydrogen, optionally substituted linear and branched alkyl and alkenyl containing 1 to 8 carbon atoms, optionally substituted cycloalkyl, optionally substituted aryl, OR and NR₂; and Z is optionally substituted linear and cyclic C₂-C₇ alkylene, optionally substituted metallocenediyl and optionally substituted C₈-C₂₂ arylene.

38. (Original) The process according to claim 37, wherein the ligand R₂P-NR⁸-Z-NR⁸-PR₂ is selected from the group consisting of DPPACH and DCYPPACH.

39. (Previously Amended) The process according to claim 1, wherein the diamine ligand has the Formula NH₂-Z-NH₂:



wherein Z is selected from the group consisting of optionally substituted linear and cyclic C₂-C₇ alkylene, optionally substituted metallocenediyl and optionally substituted C₈-C₂₂ arylene.

40. (Original) The process according to claim 39, wherein the diamine ligand is chiral and includes (1) compounds in which at least one of the amine-bearing centers is stereogenic, (2) compounds in which both of the amine-bearing centers are stereogenic and (3) atropisomeric bis-tertiary diamines, in which the two nitrogen atoms are linked by a biaryl backbone.

41. (Original) The process according to claim 39, wherein the diamine ligand $\text{NH}_2\text{-Z-NH}_2$ is selected from the group consisting of CYDN and DPEN.

42. (Previously Amended) The process according to claim 1, wherein the diamine is a bidentate ligand of the Formula D-Z-NHR^9 in which Z is selected from the group consisting of optionally substituted linear and cyclic $\text{C}_2\text{-C}_7$ alkylene, optionally substituted metallocenediyl and optionally substituted $\text{C}_6\text{-C}_{22}$ arylene; D is an amido group donor or a chalcogenide radical selected from the group consisting of O, S, Se and Te; NHR^6 is an amino group donor in which R^9 is selected from the group consisting of hydrogen, optionally substituted linear and branched alkyl and alkenyl containing 1 to 8 carbon atoms, optionally substituted cycloalkyl and optionally substituted aryl.

43. (Original) The process according to claim 42, wherein D is NR^{10} , wherein R^{10} is selected from the group consisting of $\text{S(O)}_2\text{R}^{10}$, $\text{P(O)(R}^{10})_2$, C(O)R^{10} , $\text{C(O)N(R}^{10})_2$ and $\text{C(S)N(R}^{10})_2$, in which R^{10} is independently selected from the group consisting of hydrogen, optionally substituted linear and branched alkyl and alkenyl containing 1 to 8 carbon atoms, optionally substituted cycloalkyl and optionally substituted aryl.

44. (Original) The process according to claim 42, wherein the diamine is chiral and includes (1) compounds in which the amine-bearing center is stereogenic, (2) compounds in which both the donor-bearing (D) and amine-bearing centers are stereogenic.

45. (Original) The process according to claim 44, wherein the diamine is $\text{CH}_3\text{C}_6\text{H}_4\text{SO}_3\text{NCHPhCHPhNH}_2$.

46. (Previously Amended) The process according to claim 1, wherein the ligands X and Y is selected from the group consisting of Cl, Br, I, H, hydroxy, alkoxy and acyloxy.

47. (Previously Amended) The process according to claim 1, wherein the base is an alcoholate or an hydroxide salt selected from the group consisting of compounds of the Formula $(R^{12}O)_2M'$ and $R^{12}OM''$, in which M' is an alkaline-earth metal, M'' is an alkaline metal and R^{12} is selected from the group consisting of hydrogen, C_1 to C_6 linear and branched alkyl.

48. (Previously Amended) The process according to claim 1, wherein the base is an organic non-coordinating base.

49. (Original) The process according to claim 48, wherein the base is selected from the group consisting of DBU, NR_3 and phosphazene.

50. (Previously Amended) The process according to claim 1, wherein the hydrogenation is carried out in the absence of a solvent.

51. (Previously Amended) The process according to claim 1, wherein the hydrogenation reaction is carried out in the presence of a solvent.

52. (Original) The process according to claim 51, wherein the solvent is selected from the group consisting of benzene, toluene, xylene, hexane, cyclohexane, tetrahydrofuran, primary and secondary alcohols, and mixtures thereof.

53. (Original) The process according to claim 51, wherein the hydrogenation is carried out in an amine solvent.

54-56. (Previously Cancelled)